Sponges and Anemones

Sea Sponges and Sea Anemones are part of a functional group known as ‘Filter Feeders’. The Wadden Sea and North Sea are home to a variety of species belonging to these two groups of organisms. Sea Anemones are members of the general phylum ‘Cnidaria’, much like their jellyfish cousins (Explore animals, n.d.). Unlike jellyfish, Sea Anemones are classified as Actinaria. However, most members of the species belong to either one of four sub-orders (Daly et al., 2008). These orders are split into Nynantheae, Endocoelantheae, Protantheae and Ptytochdactea, together they hold up to 1100 documented species of Actinaria (Daly et al., 2008). Sea Sponges, however, are members of the Phylum Porifera, a group of organisms that are considered simplistic in nature in comparison to higher forms of multi-cellular life (Reiswig et al., 2010). Sea Sponges possess no organs and are made entirely of tissue and complex structures of cells that allow them to perform tasks required to live and procreate (Reiswig et al., 2010). Most species of sponges are quite old and have been recorded for quite some time. The total amount of currently described sponges amounts to 5000 species throughout its suborders.

History/ Population trends

Porifera are considered the oldest phylogenetic members of the Metazoan, which are species said to share genetic ancestry with cnidarians and flatworms (Müller, 2003). As determined from fossils recovered from sites in China, Metazoan ancestry goes back as far as the Late Proterozoic, an era that dates back 540 million years ago (Müller et al., 2004). Ancient Porifera are believed to had been comprised of a colony of single cells working together to sustain themselves, similar to corals or species of fungi (Müller, 2003). These similarities are drawn via the cell-bonds found in the fossil records of Porifera, which appear similar to fungi when compared next to each other. Actiniarians are no different in their long history of intriguing evolutionary feats. Similarly to their cousins Sea Anemones all possess a form of neurotoxin that they may use for either defence or for preying on other creatures. The oldest forms of species of sea anemones dates back to the Ediacarian period (Jouiaei et al., 2015). A period that spanned from the end of the Cryogenian period to the beginning of the Cambrian period. Today, both Sea Sponges and Sea Anemones are scarcely found along the bed of the Wadden Sea. Both species require hard substrates to properly settle and grow, specifically substrates containing high densities of large gravel can be quite attractive to them (Lotze, 2005). In the German Wadden Sea the species Urticina felina was often found living on bivalve shells, and an even greater density on substrates consisting of gravel (Schückel et al., 2015). Their requirement for hard substrate is clear, that of which is rarely found in the environment of the Wadden Sea (Wadden Sea World Heritage, n.d.).

North Sea vs Wadden Sea

Human activity has been the driving factor of ecological change in the marine environment, which also extends to the benthic environment of the North Sea and Wadden Sea. In this a discrepancy can be drawn between the two regions via the pressures that can have significant impact on the population of both Sea Anemones and Sea Sponges. Across the North Sea are a great deal of oil and gas rigs that mine for recourses, these rigs are known to distribute crude oil and carbon-rich sediments into the water column during operations (Hogg et al., 2010). On the Wadden Sea scientists have concluded that dredging has had a negative impact on bivalve recruitment, which by extension also impacts the settlement opportunities of Sea Sponges and Sea Anemones (van der Meer & Former, 2023). Both regions harbour anthropogenic pressures which are quite detrimental to the species. However, drilling is considered to be significantly more dangerous due to the far-reaching effects of oil spilling into the water column (Dicks et al., 1986). This study has identified no specific species that could be considered in either sea, but found that non-native species are present in both (Reiswig et al., 2010).

Diet

- Zooplankton (Reiswig et al., 2010)
- Phytoplankton (Reiswig et al., 2010)

Sources

Daly, M., Chaudhuri, A., Gusmão, L., & Rodríguez, E. (2008). Phylogenetic relationships among sea anemones (Cnidaria: Anthozoa: Actiniaria). *Molecular phylogenetics and evolution*, *48*(1), 292-301. https://www.sciencedirect.com/science/article/pii/S105579030800095X

Dicks, B., Bakke, T., & Dixon, I. M. T. (1986). Oil exploration and production: Impact on the North Sea. *Oil and Chemical Pollution*, *3*(4), 289-306. https://www.sciencedirect.com/science/article/pii/S0269857986800326

Lotze, H. K. (2005). Radical changes in the Wadden Sea fauna and flora over the last 2,000 years. *Helgoland Marine Research*, *59*, 71-83. https://link.springer.com/article/10.1007/s10152-004-0208-0

Explore Animals. (n.d.). *Animalia*. Consulted on 14th of October 2024 Cnidaria (animalia.bio)

Hogg, M. M., Tendal, O. S., Conway, K. W., Pomponi, S. A., Van Soest, R. W. M., Gutt, J., ... & Roberts, J. M. (2010). Deep-sea sponge grounds: reservoirs of biodiversity. *UNEP-WCMC biodiversity series*, *32*, 1-86. https://pure.uva.nl/ws/files/1302977/93777_Deep_sea_sponge_grounds.pdf

Jouiaei, M., Sunagar, K., Federman Gross, A., Scheib, H., Alewood, P. F., Moran, Y., & Fry, B. G. (2015). Evolution of an ancient venom: recognition of a novel family of cnidarian toxins and the common evolutionary origin of sodium and potassium neurotoxins in sea anemone. *Molecular biology and evolution*, *32*(6), 1598-1610. https://academic.oup.com/mbe/article-abstract/32/6/1598/1075105

Lotze, Heike L. (2005). Radical changes in the Wadden Sea fauna and flora over the last 2000 years. *Helgoland Marine Researcg 59*. 71-83. https://link.springer.com/article/10.1007/s10152-004-0208-0

Müller, W. E. (2003). The origin of metazoan complexity: Porifera as integrated animals. *Integrative and Comparative Biology*, *43*(1), 3-10. https://academic.oup.com/icb/article-abstract/43/1/3/604434

Müller, W. E., Schwertner, H., & Müller, I. M. (2004). Porifera a reference phylum for evolution and bioprospecting: the power of marine genomics. *The Keio Journal of Medicine*, *53*(3), 159-165. https://www.jstage.jst.go.jp/article/kjm/53/3/53_3_159/_article/-char/ja/

Reiswig, H. M., Frost, T. M., & Ricciardi, A. (2010). Porifera. In *Ecology and classification of North American freshwater invertebrates* (pp. 91-123). Academic Press. https://www.sciencedirect.com/science/article/pii/B9780123748553000042

Schückel, U., Beck, M., & Kröncke, I. (2015). Macrofauna communities of tidal channels in Jade Bay (German Wadden Sea): spatial patterns, relationships with environmental characteristics, and comparative aspects. *Marine Biodiversity*, *45*, 841-855. https://link.springer.com/article/10.1007/s12526-014-0308-2

Van der Meer, J., & Folmer, E. (2023). A re-evaluation of the effects of mechanical cockle dredging in the Dutch Wadden Sea. *Journal of Applied Ecology*, *60*(11), 2497-2504. https://www.researchgate.net/profile/Eelke-Folmer/publication/374291772_A_re-evaluation_of_the_effects_of_mechanical_cockle_dredging_in_the_Dutch_Wadden_Sea/links/651fd41b3ab6cb4ec6beeab1/A-re-evaluation-of-the-effects-of-mechanical-cockle-dredging-in-the-Dutch-Wadden-Sea.pdf

Wadden Sea World Heritage. (n.d.). *Quality Status Report*. Macrozoobenthos | Wadden Sea Quality Status Report (waddensea-worldheritage.org)